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BOTANY.—*A phytogeographical sketch of southern Maryland.* ROLAND M. HARPER, Office of Farm Management. (Communicated by A. S. Hitchcock.)

Southern Maryland, according to local usage, is that part of the state between Chesapeake Bay and the fall line, including the counties of Anne Arundel, Prince Georges, Calvert, Charles, and St. Marys, and small parts of a few others. The few botanists who have written about this area[1] have generally treated it as a geographical unit; but its vegetation is really very diversified. Geologists have subdivided this part of the coastal plain in two different ways: first according to the outcroppings of the various Cretaceous and Tertiary strata, and second according to the superficial formations, which are supposed to represent four Pleistocene terraces.[2]

For phytogeographical purposes southern Maryland can be divided into five more or less distinct regions, the soil, topography, and vegetation of each of which vary only within certain limits. Two of them correspond pretty closely with the areas in which certain Cretaceous and Eocene formations are exposed, and another with the oldest and highest Pleistocene (or perhaps Pliocene) terrace. One cannot be correlated very well with any

[1] The most comprehensive account is that by Chrysler in the Plant Life of Maryland, pp. 149–197 (Baltimore, 1910).

[2] These terraces have been discussed at length, with numerous maps, by G. B. Shattuck in his report on the Pliocene and Pleistocene, a separate volume of 291 pages and 75 plates published by the Maryland Geological Survey in 1906.

existing maps of geology or soil, and the last includes the remainder not otherwise disposed of, which may possibly be subdivided hereafter.

Within the last two years the writer has utilized many Sundays and holidays and a few other days in making pedestrian excursions through all the counties named for the purpose of studying the vegetation and other geographical features. Copious notes have been taken en route, which are now sufficiently complete to form the basis of a fairly accurate quantitative analysis of the existing plant covering, at least as far as the more common and conspicuous native species, especially trees, are concerned.[3] These quantitative studies bring out many differences that the ordinary floristic or qualitative lists fail to show; for it happens that the vast majority of the native plants of Maryland belong to common and widely distributed species[4] (especially is this true of the trees), so that the number confined to any one region would be exceedingly small.

In this preliminary paper each region will be described very briefly, and then its commonest trees listed as nearly as possible in order of abundance. The wooded area of each region, and the percentage of evergreens in the forests, have been estimated with the aid of Besley's recent report on the forests of the state.[5] No attempt is made to assign percentages to the different species at this time, but it happens that the first one in each list constitutes not far from 20 per cent of the total, and the numbers for the others would form something like a descending geometrical progression (like the population figures for cities arranged in order of size, and numerous other kinds of statistics). Where it is reasonably certain that a given species is more abundant in one of the regions than in any of the others its name in that list is starred, which will enable the reader to pick out the characteristic species of each region at a glance.[6] Evergreens are

[3] For an outline of the methods used see 6th Ann. Rep. Fla. Geol. Surv. 177–180. 1914; Torreya 17: 1–2, 5–7. 1917.

[4] See Torreya 11: 36. Feb. 1911.,

[5] Baltimore, 1917. Reviewed in Torreya 18: 120–122. 1918.

[6] For an application of a method similar to this to the trees of Illinois see Torreya 18: 168–170. 1918. This plan should be useful also to any one desiring a supply of a particular kind of timber, e.g., black walnut.

indicated by the letter E, and the percentage of them for each region has been estimated, for that seems to be a good index of soil fertility. Common names are added for the benefi of nonbotanical readers who may have occasion to explore some of the same territory.

The plant lists include only native forest trees large enough to be sawn for lumber, those being the most conspicuous and important components of the vegetation. If smaller trees, such as the dogwood, were included it would be difficult to compare them with the larger ones with respect to abundance, and very little additional contrast would be gained thereby, for it happens that the dogwood is the commonest small tree in all five regions (as well as in many other parts of the eastern United States). A few notes on shrubs and herbs are added, but to attemptto list those would require entirely too much space for the limits of this paper. The names of trees seen only a few times in a given region are omitted, because of the possibility of their having been wrongly identified, or not properly belonging to the region.

1. THE FALL-LINE CLAY HILLS

This corresponds approximately with the region of the nonmarine Lower Cretaceous formations (Potomac group), which form a belt averaging seven or eight miles wide adjacent to the fall line all the way across Maryland and the District of Columbia and a little way into adjoining states. It is analogous in many ways to the fall-line sand hills of the Carolinas and Georgia, and some of its features, particularly the mottled clays and ferruginous sandstones, are matched very closely in a belt just below the fall line in Alabama. It is most typically developed between Washington and Baltimore, where it occupies all the country between the Baltimore & Ohio Railroad and the Washington, Baltimore & Annapolis electric line, and a little more on either side.

The underlying strata, exposed in innumerable cuts, consist of pinkish or mottled stiff clay, more or less mixed with sand and gravel, and the soils are mainly sandy and gravelly loams, all distinctly acid or noncalcareous. The surface is strewn in

many places with fragments of ferruginous sandstone. The topography varies from flat terraces near sea level to steep hills rising some 350 feet higher. Streams are numerous, but the smaller ones on the more clayey soils are intermittent. The gravelly bogs recently described by McAtee in his Natural History of the District of Columbia[7] are almost confined to this region.

About 40 per cent of the area is still wooded, in spite of its proximity to two large cities, and there was a movement about five years ago looking toward the establishment of a national forest between Baltimore and Washington.

The commonest trees seem to be:

E **Pinus virginiana.* Scrub pine.
Quercus alba. White oak.
Acer rubrum. Red maple.
E **Pinus rigida.* Pitch pine.
**Quercus velutina.* Black oak.
Castanea dentata. Chestnut.
Liriodendron tulipifera. Poplar.
**Quercus montana.* Chestnut oak.
Betula nigra. Birch.
Liquidambar styraciflua. Sweet gum.
Fagus grandifolia. Beech.
Quercus falcata. Red oak (southern).
Nyssa sylvatica. Sour gum.
Quercus marylandica. Black-jack oak.
Quercus palustris. Pin oak.
Platanus occidentalis. Sycamore.
Quercus coccinea. Scarlet oak.
Quercus stellata. Post oak.
E *Pinus echinata.* Short-leaf pine.
Hicoria alba. Hickory.
Quercus phellos. Willow oak.
Hicoria glabra? Hickory.

Evergreens make up about 35 per cent of the forest, and oaks a little less. The undergrowth consists very largely of shrubs belonging to the Ericales, of which *Gaylussacia baccata* (huckleberry) is probably the commonest. *Epigaea* (arbutus) is very common, and apparently in no immediate danger of extermination.

2. THE GREENSAND BELT

This is determined by the outcrop of several Upper Cretaceous and Eocene formations which consist largely of greensand marl. It lies immediately southeast of the belt just described and is of about the same width. The boundary between them is pretty sharply defined in some places, e.g., near Brightseat. It is mostly north of the Chesapeake Beach Railway, and is best

[7] Bull. Biol. Soc. Wash. 1: 74-90. May, 1918.

developed between that and the Patuxent River. The same or similar geological formations extend northeastward nearly to New York, making fairly fertile soils all the way, but east of Chesapeake Bay the topography and vegetation are somewhat different.

The soils are largely, if not mostly, derived from Pleistocene material, and are loamy sands, fine sandy loams, etc. In some places, particularly near Upper Marlboro, the greensand comes to the surface and gives the soil a decided greenish yellow tinge, which is a very rare color for soils. On the whole the soils are rather above the average in fertility.

The topography is a little less hilly than that of the fall-line hills, and there are more flat areas, but small rounded knolls or knobs averaging perhaps 500 feet in diameter and 15 or 20 feet high are very characteristic, even in some of the valleys separated from the main body of the greensand.

The region has been extensively farmed for over 200 years, and the forests reduced to a little less than a third of the area. Nearly all are second growth, but a few magnificent original stands of yellow poplar, white oak, etc., have been preserved.[8] Evergreens constitute not more than 10 per cent of the total, and as the prevailing evergreen is the scrub pine, which is partial to worn-out fields, etc., we may infer that the original forests were almost wholly deciduous.

The commonest trees at present seem to be as follows:

Liriodendron tulipifera. Poplar.
E *Pinus virginiana.* Scrub pine.
Quercus alba. White oak.
Acer rubrum. Red maple.
**Fagus grandifolia.* Beech.
**Betula nigra.* Birch.
Castanea dentata. Chestnut.
Liquidambar styraciflua. Sweet gum.
**Ulmus americana.* Elm.
**Platanus occidentalis.* Sycamore.
Quercus velutina. Black oak.
Nyssa sylvatica. Sour gum.
**Fraxinus americana.* Ash.
**Quercus borealis maxima.*[9] Red oak (northern).
Quercus palustris. Pine oak.
Hicoria alba. Hickory.
Quercus falcata. Red oak (southern).
Morus rubra. Mulberry.

Any one familiar with the habitats of these trees will notice a great contrast between the starred ones in this list and the pre-

[8] For the location of some of these see map of Prince Georges County in Besley's forest report previously mentioned.

[9] Formerly referred to *Q. rubra.* See Torreya 17: 135. 1917.

ceding in the matter of soil preferences. The huckleberries and other low shrubs are rather scarce in this region. The commonest herb in undisturbed forests is probably *Meibomia nudiflora*. Oaks seem to make up less than one-fifth of the standing timber.

3. THE BAY SHORE HILLS

This name may be applied to a north-south strip about five miles wide and 25 miles long, bordering Chesapeake Bay in Anne Arundel and Calvert counties. Chesapeake Beach is near the middle of this strip, and its western edge is about on the divide between the bay and the Patuxent River. The underlying strata are Miocene of the Chesapeake group (well exposed in the high cliffs just south of Chesapeake Beach), but they are by no means peculiar to the region under consideration.

The soils are rather loamy, approaching clay loam or silt loam in some places, generally of a light brown color, and evidently quite fertile. The topography is probably the most broken of any region in the Atlantic coastal plain. Some of the bluffs facing the bay are over 100 feet high, and two or three miles farther back elevations of 150 feet or so are reached. And yet hillsides with a slope of 30° or more have been cultivated for years with very little trouble from soil erosion.

About 40 per cent of the area is wooded now, and evergreens make up about 16 per cent of the forest. The commonest trees seem to be:

**Castanea dentata*. Chestnut.
**Liriodendron tulipifera*. Poplar.
E *Pinus virginiana*. Scrub pine.
**Liquidambar styraciflua*. Sweet gum.
E *Pinus taeda*. Loblolly pine.
Quercus alba. White oak.
Fagus grandifolia. Beech.
**Juglans nigra*. Black walnut.
**Morus rubra*. Mulberry.
Ulmus americana. Elm.
Quercus falcata. Red oak (southern).
Quercus velutina. Black oak.
Hicoria alba. Hickory.
Hicoria sp.[10] Hickory.
Platanus occidentalis. Sycamore.
Nyssa sylvatica. Sour gum.
Quercus borealis maxima. Red oak (northern).
**Prunus serotina*. Wild cherry.

[10] Not yet identified. Perhaps more than one species.

A comparison of the starred species in this and the preceding list, in connection with chemical analyses of representative soils of the two regions, should throw valuable light on the soil preferences of the trees involved. In the abundance of chestnut and poplar, and in a few other particulars, this region differs from all other parts of the coastal plain and resembles the Piedmont region, particularly that part immediately north of the District of Columbia. The chestnut is now badly blighted, and this is said to have happened only in the last three or four years. The undergrowth comprises a remarkable number of herbs with compound leaves (such as *Cimicifuga*, *Phegopteris hexagonoptera*, and *Botrychium virginianum*) or barbed fruits (*Cynoglossum*, *Circaea*, *Washingtonia*, *Meibomia*), and others that are more characteristic of hilly or even mountainous regions (e.g., *Oxalis violacea*, *Obolaria*, *Arabis canadensis*, *Hepatica*). *Asimina triloba* (pawpaw) is one of the commonest shrubs or small trees. The Ericales are almost wanting. The various oaks constitute only about 11 per cent of the forest: a very small figure for this part of the world.

4. THE BRANDYWINE PLATEAU

This corresponds pretty closely with the area mapped by Maryland geologists as occupied by the Lafayette or Brandywine terrace (the latter name taken from the village of Brandywine in Prince Georges County). Its northern extremity is near the eastern corner of the District of Columbia, nearly 300 feet above sea-level, and it extends southward with gradually decreasing altitude to the vicinity of LaPlata and Charlotte Hall. It is perhaps the best example of a plateau in the whole coastal plain.

The general surface of the uplands is rather flat, but is deeply dissected by several creeks, some of which cut down into the greensand and make fertile valleys a mile or more wide. These valleys have proved a well-nigh insuperable obstacle to building railroads from Washington in the direction of Leonardtown,

and St. Marys County is now without railroad connections. The plateau is something like a miniature of the Highlands of New Jersey or the Cumberland Plateau of Tennessee and Alabama, which have broad well-wooded uplands with poor soil, interrupted by occasional cultivated limestone valleys. The soil is mostly loam of a pale buff color ("Leonardtown loam"), varying toward sand in some places. One of the gravelly bogs mentioned above is known in this region, and possibly others may be hidden away among the forests.

About 55 per cent of the area is still wooded, and perhaps half of that is virgin forest, or at least occupies land that has never been cultivated. Evergreens constitute about 25 per cent of the timber. The commonest trees are about as follows:

E *Pinus virginiana*. Scrub pine.
**Quercus alba*. White oak.
Liquidambar styraciflua. Sweet gum.
**Quercus marylandica*. Black-jack oak.
Quercus stellata. Post oak.
Quercus falcata. Red oak (southern).
**Nyssa sylvatica*. Sour gum.
**Quercus phellos*. Willow oak.
**Quercus coccinea*. Scarlet oak.
Acer rubrum. Red maple.
Castanea dentata. Chestnut.
Liriodendron tulipifera. Poplar.
E **Juniperus virginiana*. Cedar.
Quercus velutina. Black oak.
Fagus grandifolia. Beech.
Quercus montana. Chestnut oak.
Hicoria alba. Hickory.
**Hicoria glabra*. Hickory.
Quercus palustris. Pin oak.
E *Pinus rigida*. Pitch pine.

The various oaks here make up nearly half the forest, or more than in any of the other four regions. The shrubby and herbaceous undergrowth is very similar to that of the fall-line clay hills.

5. THE ST. MARYS REGION

Under this head is lumped for the present the remainder of southern Maryland, namely, all south of latitude 38° 30′, together with the Patuxent Valley as far up as a line connecting Annapolis and Upper Marlboro. It is all underlain by Miocene strata, except the southwest corner, in the great bend of the Potomac River, where there is an Eocene greensand area around Nanjemoy that is comparatively inaccessible and little known.

The soil is mainly loam and sandy loam of medium fertility, and the topography is pretty thoroughly dissected into low hills

which flatten out toward tidewater. But on some of the divides in St. Marys County there are a few small shallow ponds, hardly large enough to show on topographic maps. The highest altitude is about 180 feet.

About half the area is in forest, but probably not more than one-fourth is original forest. About 40 per cent of the trees are evergreen. The prevailing species seem to be as follows:

E *Pinus virginiana*. Scrub pine.
**Quercus falcata*. Red oak (southern).
Quercus alba. White oak.
Liquidambar styraciflua. Sweet gum.
Castanea dentata. Chestnut.
Quercus stellata. Post oak.
E **Pinus taeda*. Loblolly pine.
Liriodendron tulipifera. Poplar.
Quercus velutina. Black oak.
Acer rubrum. Red maple.
Nyssa sylvatica. Sour gum.
**Hicoria alba*. Hickory.
Fagus grandifolia. Beech.
Quercus marylandica. Black-jack oak.
E *Juniperus virginiana*. Cedar.
Quercus phellos. Willow oak.
Quercus montana. Chestnut oak.
Pinus echinata. Short-leaf pine.
Quercus coccinea. Scarlet oak.
Platanus occidentalis. Sycamore.
Betula nigra. Birch.
Hicoria glabra. Hickory.
Ulmus americana. Elm.

Oaks here make up a little more than one-third of the forest. The few species starred may prefer this region to the other four simply because it is the southernmost and warmest, for they all range much farther southward than northward. Among the small trees or large shrubs *Ilex opaca*, *Aralia spinosa*, and *Myrica cerifera* are much commoner here than in the other regions, probably for the same reason. The smaller shrubbery does not differ much from that in regions 1 and 4.

PLANT PHYSIOLOGY.—*The reactions of the soils supporting the growth of certain native orchids.* EDGAR T. WHERRY, Washington, D. C.

That soil reaction is an important factor in connection with the growth of certain plants is now thoroughly established—most legumes require an alkaline soil, most heaths an acid one, and so on. It has seemed to the writer a matter of interest to ascertain the relations in the case of some of the less widespread native plants, and during vacation trips for several years past tests have been made with this end in view. The results obtained with the Orchidaceae are here presented.

The majority of the native orchids grow either in bog-peat or in upland peat, both of which are usually acid in reaction. Several species of the genera Cypripedium, Habenaria,[1] Spiranthes, etc., are, however, known to grow in limestone regions, where the soil may possess a distinctly alkaline (basic)[2] reaction. It seemed desirable to confirm these inferences as to the reactions of the soils in all cases, for, as the following examples will show, incorrect deductions may readily be drawn from superficial examinations.

In some limestone valleys in northern Pennsylvania and New Jersey choked by glacial drift, swamps and bogs have developed in which the standing water and underlying soil are alkaline, owing to the presence of calcium bicarbonate in solution. The orchids growing there, which include several Cypripediums, *Spiranthes lucida*, *Arethusa bulbosa*, etc., might all be presumed to be calciphilous and to require an alkaline soil. Actual tests have shown, however, that while the tall Cypripediums do indeed grow in the calcareous water, *C. acaule* and the other two plants noted grow upon hummocks of sphagnum or other mosses, where the soil proves to be decidedly acid in reaction.

In other instances *Cypripedium acaule*, usually an acid soil species, has been found in dry woods in limestone valleys, and might have been classed as tolerant of alkaline conditions. But in every case chemical tests have shown normal acidity, and its roots have proved to be imbedded in sandstone drift so thick as to exclude any possible effect of the underlying rock.

[1] The nomenclature of Gray's Manual, 7th edition, 1908, is used here; for the benefit of those who prefer other names, important synonyms are added in the table containing the summary of results. In a study like the present it would appear to make no difference what code of nomenclature is followed, so long as the plants are correctly identified, and in this direction the utmost care has been taken.

[2] The term alkaline is here used in the physical-chemical sense, and has nothing to do with the so-called "alkali" soils, in which there may be a neutral salt of an alkali metal, so that the reaction is not necessary alkaline at all. According to the usage adopted, alkaline is essentially synonymous with basic, and refers to the presence of free hydroxyl ions, and ability to neutralize acids, irrespective of the actual base present.

It seems evident that conclusions as to the requirement of alkaline or acid conditions by a given species can be depended upon only when based on actual investigation of the soils in which they grow.

There are two methods in use for determining the reactions of soils: titration, which shows the quantity of acid or alkali present, and measurement of hydrogen-ion concentration, which furnishes information as to the strength of the acid or alkali. The latter feature being the more significant from the biochemical point of view,[3] attention has been confined to it.

The following procedure has been adopted for making the observations: A sample of soil a gram or two in weight is shaken up thoroughly in a thick-walled test-tube 1.5 cm. in diameter with about 5 cc. of the purest water available and allowed to stand at an angle of 45 degrees until the bulk of the suspended matter has settled. One cc. of this liquid is pipetted off and placed in a 1 cm. wide test-tube, and to it a like volume of an indicator solution is added. In another 1 cm. tube 1 cc. of the same indicator is diluted with 1 cc. of water. In order to overcome the effect of the remaining turbidity, an additional portion of the soil extract is diluted somewhat in a 1.5 cm. tube of the same length as the narrower one containing the indicator, and the latter tube is plunged into the cloudy liquid. The effect of the turbidity on the color of the indicator is thereby rendered the same in both tubes, but in the one case the indicator and soil extract are mixed, in the other they are separate, and the slightest change of color produced by any acid or alkali in the soil extract may be readily seen on comparison of the two tubes.

The indicators covering the extreme range likely to be met with in ordinary soils, their color changes, and the intensities of acidity or alkalinity corresponding to each color, are listed in table 1. Instead of describing the reactions by the rather difficultly comprehensible exponential method, as is ordinarily done by physical chemists, direct numerical intensities are here employed. According to this plan the more intense the acidity,

[3] See Gillespie, *Journ. Wash. Acad. Sci.* 6: 7. 1916; Sharp and Hoagland, *Journ. Agr. Res.* 7: 123. 1916; Clark and Lubs, *Journ. Bact.* 2: 109. 1917; etc.

the larger the number used to describe it; thus, a liquid with an intensity of 1000 is 10 times as acid as one with an intensity of 100, and so on.[4]

TABLE 1

INDICATORS* FOR SOIL ACIDITY AND ALKALINITY DETERMINATION

	INTENSITY OF ACIDITY							
	3000	1000	300	100	30	10	3	1
Bromphenol blue.....	yellow	green	vio.-blue					
Methyl red.			vio.-red	br.-red	orange	yellow		
Bromcresol purple....					yellow	br.-red	red-vio.	
Phenol red..							yellow	orange

	INTENSITY OF ALKALINITY				
	1	3	10	30	100
Phenol red.....	orange	br.-red	vio.-red		
Phenolphthalein.....			white	pink	red

* Samples of several of these were kindly supplied to the writer by Dr. H. A. Lubs.

The indicators are used in extremely dilute solutions, mostly about 0.0001 per cent, although it is most convenient to transport them into the field in more concentrated form, and to dilute them as needed. For the first examination of each soil phenol red is employed, as its color changes occur around the true neutral point, at which, according to the plan here adopted, acidity = alkalinity = 1. When the effect produced is that of either its most acid or most alkaline color, the procedure is repeated with indicators showing changes over adjoining ranges

[4] This plan was used by the writer in a previous paper on a similar subject, *Journ. Wash. Acad. Sci.* **6**: 675–676. 1916. Its simplicity has led to its employment throughout the present one, but for the benefit of those accumstomed to the P_H values, they are added to the table containing the summary of results. To transform numerical intensities into P_H exponents: if acid, subtract the power of 10 represented by the number from 7; if alkaline, add 7 to it. The "two points of interest on the scale of hydrogen-ion exponents for soils" recently discussed by Gillespie (*Science* **48**: 393–394. 1918), namely 6.0, the acid limit for *Azotobacter*, and 5.2, that for the potato-scab organism, would be represented in the scale here used by acid 10 and acid 63 respectively.

of acidity or alkalinity, and this is continued until either an intermediate color of one indicator, or opposing extremes of two overlapping ones, are obtained.

The soils supporting the growth of all of the commoner species of orchids native to the east-central states have been studied by this method, about 200 soil samples, collected as close to the roots of the plants as possible, having been examined. The results can best be expressed by describing first the relations found to exist in the different types of habitat, taken up in the order of increasing acidity.

In swamps in limestone regions the reaction of the standing water and of the underlying soil may be distinctly alkaline, because of accumulation of calcium bicarbonate. This substance in saturated solution may show an alkalinity of 100 or more, but in bogs supporting the growth of orchids it appears never to be sufficiently concentrated to exceed the alkaline intensity of 10. The only orchids which have been noted as growing in a soil with such a reaction are the tall Cypripediums, *C. candidum*, *C. hirsutum*, *C. parviflorum*, and the variety *pubescens*. The writer has not had opportunity to carry his studies north of Pennsylvania, but several more northern species are reported to grow frequently or exclusively in calcareous, (or "marly") bogs in which the reaction is no doubt similar to that here noted; these include *Calypso bulbosa*, *Habenaria dilatata*, *H. hyperborea*, *Microstylis monophyllos*, and *Spiranthes romanzoffiana*.[5]

Calcareous (alkaline) soils may also develop in woods above limestone rocks, so it seemed interesting to inquire if the same or related species of orchids might grow in such situations. Two instances have been brought to the writer's attention, *Cypripedium parviflorum* and *Orchis spectabilis*, growing in black soil full of limestone chips a mile southwest of Allentown, Pennsylvania.[6] Tests of these soils showed them to be in fact slightly

[5] This list has been compiled from articles by Prof. M. L. Fernald and others scattered through the journal *Rhodora* for several years past, supplemented by a private communication concerning occurrences in New York kindly sent by Prof. K. M. Wiegand.

[6] These were located by Mr. Harold W. Pretz of Allentown.

alkaline, so that this habitat is comparable with the preceding one. On the other hand, the same two species have been found elsewhere growing in brown woods soil over noncalcareous rocks, exhibiting a distinctly acid reaction, although in no case where the plants appeared to be in a flourishing condition was the intensity greater than 100. In so far as the data admit of generalization, then, it may be stated that the showy orchid and the yellow lady's slipper prefer habitats in which the reactions do not extend far to either side of the neutral point.

Acid intensities ranging from 1 (neutrality) to 100 are shown by the brown soil of open woods, in which thrive so many orchids, such as *Aplectrum*, *Corallorrhiza*, *Epipactis*, some Habenarias, *Liparis*, some Pogonias, *Tipularia*, etc., and by the clayey soil in damp to dry meadows, supporting other Habenarias and many species of *Spiranthes*.

Bogs and swamps in noncalcareous regions show as a rule an acid reaction throughout. The spring water supplying them may be neutral or weakly acid, carbon dioxide producing for instance an intensity of 3; in other cases the water may have an intensity of as much as 300 just as it emerges from the earth, perhaps owing to the presence of traces of sulfuric acid formed by the oxidation of pyrite contained in the strata. But whatever the intensity of the water originally, the organic acids formed by the decomposition of the accumulated vegetable matter frequently attain an intensity of about 300, which, it may be noted by way of comparison, approximates that of acetic acid, when half neutralized by a strong alkali. *Calopogon pulchellus*, *Habenaria flava*, *Pogonia ophioglossoides*, *Spiranthes cernua*, *S. odorata*, and rarely other species, have been observed growing directly in the water of such swamps.

The case of *Cypripedium acaule* is rather peculiar, in that it shows a different soil preference from the other species of this genus. It has been found in sandy open woods, where the intensity of acidity proves to be 100 to 300. An associate in these surroundings is *Spiranthes beckii*. In pure rotted pine needles, in which the reaction covers the same range, it grows

alongside of *Microstylis unifolia* and *Spiranthes cernua*. It occurs also on sphagnum hummocks, the relations of which will next be described.

The hummocks of sphagnum and other mosses which develop in many swamps or bogs support a number of characteristic orchids especially *Arethusa*, *Calopogon*, *Pogonia ophioglossoides*, and the above mentioned *Cypripedium acaule*. Tests of the partially rotted vegetable matter which surrounds their roots have shown that the acidity is often greater than that of the water in the hollows between the mounds. Even in calcareous swamps, where the water is alkaline, a definite and rapid increase in acidity is found on ascending through the moss, and an intensity of 300 is often present at the top. The more acid the water in the first place, the less rapid is this increase, but the same upper limit is almost always reached. The orchids rooted in this moss may therefore be living in highly acid conditions, even though others growing between the hummocks may have their roots bathed in alkaline waters.

The habitat in which the most acid conditions of all may develop appears to be the peat overlying clay which usually occurs around the margins of bogs. In it grow *Habenaria blephariglottis*, *H. ciliaris*, *H. clavellata*, *H. cristata*, and *Liparis loeselii*. The intensity of acidity of such material has been found to vary in general from 100 to 1000. In one case, however, a soil supporting *Habenaria blephariglottis*, near Hyattsville, Maryland, the extreme value of 3000 has been observed. It may be noted here that the peat used for growing tropical orchids also shows an intensity of acidity of 100 to 1000.

The results obtained with all the species studied are collected in table 2.[7]

[7]It is not claimed that some of these plants may not occasionally grow in soils with reactions outside of the ranges here given, but these ranges are based on measurements in sufficient number to justify regarding them at least as normal. Points of special significance in the tabulated series of reactions appear to be: alkaline 10 (P_H 8.0), the greatest alkalinity observed; acid 100 (P_H 5.0), the upper acid limit for many species, and the lower limit for a few; acid 300 (P_H 4.5), the acid limit for a further large number; and acid 3000 (P_H 3.5) the greatest acidity observed.

TABLE 2

Soil Reactions of Native Orchids

SPECIES	REACTION AND RANGE OF INTENSITY	P_H
Cypripedium candidum	alkaline 10 to neutral	8.0–7.0
parviflorum	alkaline 10 to acid 100	8.0–5.0
var. pubescens (hirsutum)	alkaline 10 to acid 100	8.0–5.0
hirsutum (spectabile, reginae)	alkaline 10 to neutral	8.0–7.0
Cypripedium (Fissipes) acaule	acid 100 to 300	5.0–4.5
Orchis (Galearis, Galeorchis) spectabilis	alkaline 10 to acid 10	8.0–6.0
Habenaria (Blephariglottis) blephariglottis	acid 100 to 3000	5.0–3.5
ciliaris	acid 100 to 1000	5.0–4.0
cristata	acid 100 to 1000	5.0–4.0
fimbriata (grandiflora)	acid 10 to 100	6.0–5.0
lacera	acid 10 to 100	6.0–5.0
peramoena	acid 10 to 100	6.0–5.0
psycodes	acid 10 to 100	6.0–5.0
Habenaria (Coeloglossum) bracteata	acid 10 to 100	6.0–5.0
Habenaria (Gymnadeniopsis) clavellata (tridentata)	acid 100 to 300	5.0–4.5
nivea	acid 10 to 100	6.0–5.0
Habenaria (Lysias) orbiculata	acid 30 to 100	6.5–5.0
Habenaria (Perularia) flava (virescens)	acid 100 to 300	5.0–4.5
Calopogon pulchellus (Limodorum tuberosum)	acid 30 to 300	5.5–4.5
Arethusa bulbosa	acid 100 to 300	5.0–4.5
Pogonia ophioglossoides	acid 30 to 300	5.5–4.5
Pogonia (Triphora) trianthophora (pendula)	neutral to acid 30	7.0–5.5
Pogonia (Isotria) verticillata	acid 10 to 100	6.0–5.0
Spiranthes (Gyrostachys, Ibidium) beckii (simplex)	acid 100 to 300	5.0–4.5
cernua	acid 3 to 300	6.5–4.5
gracilis	acid 10 to 100	6.0–5.0
lucida (latifolia)	acid 10 to 100	6.0–5.0
odorata	acid 10 to 100	6.0–5.0
praecox	acid 10 to 100	6.0–5.0
vernalis	acid 10 to 100	6.0–5.0
Epipactis (Goodyera, Peramium) pubescens	acid 10 to 100	6.0–5.0
repens	acid 30 to 100	5.5–5.0
Serapias (Epipactis) helleborine (viridiflora)	acid 10 to 30	6.0–5.5
Microstylis (Acroanthes, Malaxis) unifolia	acid 30 to 300	5.5–4.5
Liparis (Leptorchis) liliifolia	neutral to acid 100	7.0–5.0
loeselii	acid 3 to 300	6.5–4.5
Aplectrum hyemale (shortii, spicatum)	acid 3 to 100	6.5–5.0
Tipularia discolor (unifolia)	acid 10 to 100	6.0–5.0
Corallorrhiza maculata (multiflora)	acid 10 to 100	6.0–5.0
odontorhiza	acid 3 to 100	6.5–5.0
wisteriana (maculata)	acid 3 to 30	6.5–5.5

In conclusion, a brief discussion of some of the relations brought out by the above table may be added. The separation of *Cypripedium acaule* from the other species, and its assignment to a separate genus, *Fissipes*, first proposed on purely botanical grounds, may perhaps be regarded as having a chemical basis, in that its soil reaction is markedly different from that of the others. A similar case, although hardly sufficiently marked to deserve taxonomic recognition, is that the Habenarias with a simple fringed lip grow in distinctly more acid soils than do those with a three-parted lip.

In some instances the reaction of the soil appears to be more important than its moisture content in determining where a given species will grow; for a single species may be found in habitats varying widely in wetness. Thus *Cypripedium acaule* grows in wet sphagnum in various swamps, and in dry sandy woods on the Coastal Plain; *Spiranthes cernua* in running water in brooks, and in dry pine needles on some District of Columbia and Pennsylvania hills; *Liparis loeselii* in oozy muck in the swamps of northern New Jersey and Pennsylvania, and in barren soapstone gravel on a steep slope along the Potomac near Washington. Yet in every case the acidity of the soils supporting each of these species varies within comparatively narrow limits. This undoubtedly signifies that the fungus living symbiotically on the roots of each species is less tolerant of changes in acidity than in moisture.

Finally, it may be worth while to consider the bearing of the above data on the cultivation of the native orchids. It seems obvious that the growth of the tall Cypripediums would be favored by the addition of a little powdered limestone to the soil; and the writer has been able to grow the northern *C. hirsutum* successfully in the District of Columbia in this way. On the other hand most species require the soil to be made distinctly or even strongly acid. This may be accomplished by adding partly decomposed peat, by mixing in pure quartz sand, and even by watering with highly dilute phosphoric acid or acid phosphate solutions. It seems probable that if more

attention should be given to the reactions of the soils into which it is proposed to transplant wild flowers in general, their cultivation would be attended with a greater degree of success.

ETHNOLOGY—*A unique form of prehistoric pottery.*[1] J. WALTER FEWKES, Bureau of American Ethnology.

The specimen of pottery here described was found by a farmer in cultivating his field near Dolores, in the southwestern corner of Colorado. The antiquities of this region show that it was inhabited in prehistoric times by a people who had made great advancement in architecture, on which account some of the best known examples of their buildings have been set aside by the Government for the permanent preservation of these remains. Some of the best known of these buildings are the cliff dwellings of the Mesa Verde National Park, but there are many others in form of castles and towers equally instructive situated in canyons and valleys west of this plateau as far as Utah. These skillful builders have left evidence of their superior craft far into New Mexico, at Aztec, and the large buildings along the Chaco Canyon. They characterize what is called the San Juan culture area, the horizon of which has not yet been determined.

This so-called San Juan culture area can be distinguished by ceramic as well as architectural features. Similar varieties of pottery are found over this whole area. In other words pottery and its decoration support architectural evidences of the extent of this culture area. We find the same technique, color, and design throughout. Foremost among the distinctive forms of pottery found in this area are the corrugated and black and white ware, types no longer manufactured and most abundant in early prehistoric times. We rarely find in this area imitations of human and animal figures in relief, a style of ceramic art quite common in northern Mexico and southern Arizona.

Several effigy vases have been collected from this area in the last few years, and it is probable that their numbers will increase year by year. The specimen here considered cannot be called

[1] Published by permission of the Secretary of the Smithsonian Institution.

an effigy base, but rather a rare double vase with handle decorated with rude representations of animals. It was plowed up by a farmer, Mr. Littrell, while working on his land near the Yellow Jacket Canyon about 5 miles south of Sandstone post office, 20 miles west of Dolores, Colorado. The exceptional features of this object are shown in the accompanying illustrations (figs. 1, 2). The vessel consists of two vases of equal size united by a handle, modeled in the form of a bird and another animal. The end of this handle to the left of the observer is

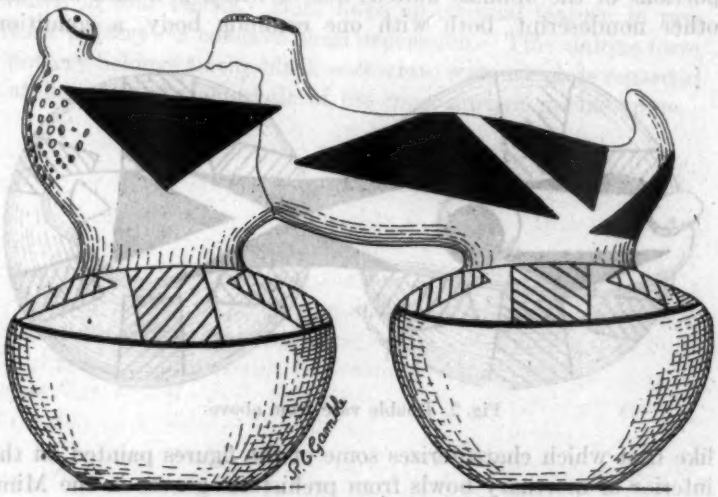

Fig. 1. Double vase from side

a rude representation of the head and body of a bird. The orifice of the vase is on the back of this bird. The representation of the bird is very crude, but triangles similar to those generally painted on the sides of the body of birds are sometimes used in pueblo pictures to designate wings. Similar black figures of triangular shape also occur over the whole handle. The head is almost globular with dots representing eyes en-

closed in a circle. The breast is spotted with black dots characteristic of bird and butterfly designs among the pueblos. An effigy vase with these symbols, undoubtedly representing a bird, was excavated last summer in a cemetery eight miles west of Sandstone Canyon.

The posterior extremity of the animal represented on the handle of the two bowls could hardly represent the tail feathers of a bird, but might be intended for the tail of another group of animals, as quadrupeds. The handle can be interpreted as portions of the animals united; one of which is a bird and the other nondescript, both with one common body, a condition

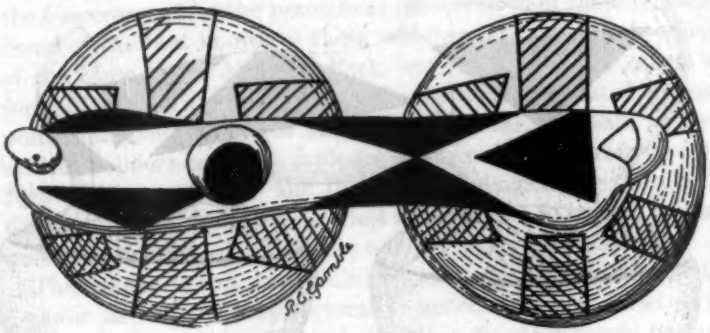

Fig. 2. Double vase from above

like that which characterizes some of the figures painted on the interior of mortuary bowls from prehistoric graves in the Mimbres Valley, New Mexico. In these are found figures of well-drawn fishes combined with an antelope or some nondescript animal combinations. Collections of pottery from Colorado and New Mexico show no designs where double animals are painted or molded.

The orifice of this double vase is situated in almost the middle of the handle, nearer that of the supposed head. It communi-

cates with the cavities of both vases through the hollow handle and suggests that the object was used as a receptacle for sacred water. It is not unusual for the Hopi priests to-day to make long pilgrimages to distant springs to procure water to use in their rites. The medicine vessels of Hopi priests are, however, smaller and simpler than that here considered, although some of these sacred vessels are furnished with handles. The size of the two members of the prehistoric vessels are about the same; both are almost spherical, slightly flattened on their upper side where they are decorated with parallel lines distributed in four blocks. Both have an unusual feature in prehistoric pottery—a concave basal depression. This unique form of pottery belongs to the black-and-white ware which is regarded as archaic and characteristic of the most ancient pueblo ruins.

ABSTRACTS

Authors of scientific papers are requested to see that abstracts, preferably prepared and signed by themselves, are forwarded promptly to the editors. The abstracts should conform in length and general style to those appearing in this issue.

ORNITHOLOGY.—*Autumn water-bird records at Washington, D. C.* HARRY C. OBERHOLSER. Proc. Biol. Soc. Wash. **30**: 122. 1917.

The autumn of 1916 at Washington, D. C., was ornithologically interesting on account of the large number of shore-bird visitors. During this period, two species, *Pisobia fuscicollis* and *Squatarola squatarola cynosurae*, were first recorded from the District of Columbia. A second record for *Micropalama himantopus*, and the fourth, fifth, and sixth records for *Spatula clypeata* were also obtained. Attracted by unusual conditions, several species stayed far beyond their previous latest dates, notable among these being *Totanus melanoleucus*, which was noted on October 26; *Totanus flavipes*, November 1 (erroneously given as November 2); *Pisobia minutilla*, November 1 (erroneously given as November 2); and *Pisobia maculata*, November 1 (erroneously given as November 2). H. C. O.

ORNITHOLOGY.—*Costa's hummingbird—its type locality, early history, and name.* T. S. PALMER. The Condor **20**: 114–116. 1918.

Costa's hummingbird (*Calypte costae*) has an interesting but somewhat obscure history. It was originally described as from California, but its type locality proves to be Magdalena Bay, Lower California, the type specimen having been collected in 1837 by Dr. Adolphe Simon Neboux during the course of a voyage of the French frigate Venus. It was named for Louis Marie Pantaléon de Costa, Marquis de Beau-Regard. Not until twenty years later was the species found in California, and not until 1876 were its eggs discovered.

HARRY C. OBERHOLSER.

ORNITHOLOGY.—*A list of the birds observed in Clay and O'Brien counties, Iowa.* IRA N. GABRIELSON. Proc. Iowa Acad. Sci. **24**: 259–272. 1918.

Clay and O'Brien counties lie in northwestern Iowa in the prairie region near the Great Plains. The country is nearly all rolling prairie now largely under cultivation, and the only timber consists of the fringes along the streams and about some of the lakes, together with the trees planted about buildings. The artificial groves have exerted an important influence in attracting numbers of birds that favor the vicinity of human habitations, and have decidedly increased their numbers. Another important result of the settling up of this part of Iowa is the draining of innumerable ponds and marshes that formerly existed in the prairie regions. This has brought about a great change in the breeding water-fowl population, for these birds have practically disappeared from the area. The present list comprises 136 species, of which forty-seven are water birds and shore birds. The latter are particularly interesting as showing what species of water-fowl lived in this region before the elimination of their favorite breeding places.

HARRY C. OBERHOLSER.

ORNITHOLOGY.—*A second bird survey at Washington, D. C.* HARRY C. OBERHOLSER. Wilson Bulletin **30**: 34–48. 1918.

The scientific results of our first comprehensive bird census near Washington, D. C., were so important that we decided to repeat it in the spring of 1917. On this second occasion twenty-two naturalists took part, and the seventeen parties covered the various kinds of country within twenty miles of the city. The date chosen was May 11, 1917, one day earlier in the month than in 1913. An extraordinary combination of circumstances made this time exceptionally favorable for birds; and the results were as remarkable as they were interesting. The total number of species observed by all the parties collectively was 166, which is, so far as we are aware, the largest number ever reported in a single day at any locality in the United States. The total number of individual birds noted was 17,074. The reasons for this rather astonishing result are not far to seek. The very cool weather of April and early May induced the winter residents to remain late, and at the same time retarded the movements of the later migrants; so that while a large number of species was present, there were only a few individuals of many of the more tardy migrants on this May 11, on which date the spring migration about Washington is

ordinarily at its height. In 1917, however, the high tide of the migration was not reached until May 17 to 23, nearly ten days later than usual. On the other hand, in 1917 some of the early migrants were very numerous for so late in the season, as, for instance, *Sitta canadensis canadensis*, *Lanivireo solitarius solitarius*, and *Carpodacus purpureus purpureus*. The occurrence of an exceptional number of rare and of occasional visitors at the time our census was taken aided materially in swelling the total number of species observed. This peculiar combination of circumstances which made possible such a great record is not likely to recur for many years. The most noteworthy of these rarities are probably *Phalacrocorax auritus auritus*, *Bonasa umbellus umbellus*, *Bartramia longicauda*, *Pelidna alpina pacifica*, *Pisobia fuscicollis*, *Larus atricilla megalopterus*, *Chlidonias nigra surinamensis*, *Hydroprogne caspia imperator*, and *Sterna hirundo*.

The following fourteen species were present on this date (May 11, 1917), later in spring than ever previously observed in the vicinity of Washington: *Anas platyrhyncha*, *Anas rubripes tristis*, *Lophodytes cucullatus*, *Tringa solitaria solitaria*, *Bartramia longicauda*, *Pelidna alpina pacifica*, *Pisobia fuscicollis*, *Larus argentatus*, *Larus delawarensis*, *Larus atricilla megalopterus*, *Hydroprogne caspia imperator*, *Sterna hirundo*, *Euphagus carolinus*, *Spizella monticola monticola*.

H. C. O.

ORNITHOLOGY.—*Notes on the subspecies of* Numenius americanus *Bechstein*. HARRY C. OBERHOLSER. The Auk **35:** 188–195. 1918.

There are two geographic races of *Numenius americanus*. The typical form, *Numenius americanus americanus* Bechstein, breeds in the western United States, excepting the northernmost part, and migrates east to the eastern United States and Newfoundland, and south to Mexico and Guatemala. The smaller northern race described as *Numenius americanus parvus* Bishop, but which has an earlier name in *Numenius americanus occidentalis* Woodhouse, breeds in southwestern Canada and the northern part of the western United States, and migrates south to Mexico, east to Iowa, casually to Rhode Island, South Carolina, and even to Jamaica.

H. C. O.

ORNITHOLOGY.—*Mutanda ornithologica. III*. HARRY C. OBERHOLSER. Proc. Biol. Soc. Wash. **31:** 47–50. May 16, 1918.

Messrs. Brabourne and Chubb have recently renamed *Haematopus ater* Sharpe from the Falkland Islands *Haematopus quoyi*, but there

already is an earlier name in *Haematopus townsendi* Audubon. The spotted redshank of Europe is now called *Totanus fuscus* (Linnaeus), but this is preoccupied, and (by inadvertence) the use of *Totanus maculatus* (Tunstall) for this species is here advocated. [The correct, because earliest, designation is *Totanus erythropus* (Pallas).] The lory commonly called *Eos riciniata* (Bechstein) should properly be called *Eos guenbyensis* (Scopoli), a name of many years' priority. The specific name of the fruit pigeon now known as *Leucotreron gularis* (Quoy and Gaimard) is preoccupied, and it is here rechristened *Leucotreron epia*. The current specific name of the South American dove known as *Gymnopelia erythrothorax* (Meyen) is preoccupied, and the bird must, therefore, be known as *Gymnopelia cecilioe* (Lesson).

H. C. O.

ORNITHOLOGY.—*The great plains waterfowl breeding grounds and their protection.* HARRY C. OBERHOLSER. Yearbook, U. S. Dept. Agr. 1917: 191–204, pls. 30–31. 1918.

For obvious reasons the breeding grounds of our waterfowl are of prime importance. Although there are valuable isolated breeding places in the west at many of the large lakes of the arid interior, the Great Plains contain the most extensive breeding grounds for waterfowl in the United States, and the best of these lie in the states of Nebraska, South Dakota and North Dakota. In the latter areas large numbers of ducks and other waterfowl breed about the lakes and sloughs, and the maintenance of their breeding ground is essential to the continuation of the game supply. In addition to hunting restrictions, an exceedingly desirable additional measure of protection is the establishment of further game preserves, both public and private.

H. C. O.

ORNITHOLOGY.—*Birds collected by Dr. W. L. Abbott on various islands in the Java Sea.* HARRY C. OBERHOLSER. Proc. U. S. Nat. Mus. **54**: 177–200. November 2, 1917.

This paper contains the ornithological results of Dr. W. L. Abbott's visits to four islands in the Java Sea. These islands, which apparently had never been previously visited by an ornithologist, are Solombo Besar, Arends, Mata Siri, and Kalambau.

On Solombo Besar Island, from December 3 to 6, 1907, Dr. Abbott collected 33 specimens representing 10 species, 8 of which proved to be

undescribed forms. The most interesting of these new birds are *Kakatoe parvulus abbotti*, which marks a new western limit for the genus; *Perissolalage chalepa*, a new genus and species of Campephagidae, related to *Lalage* Boie; a drongo, *Dicruropsis pectoralis solombensis;* and an apparently distinct species of white-eye, *Zosterops solombensis*, allied to *Zosterops flava* of Java.

Only three species were obtained on Arends Island, November 23 to 24, 1908, but one of these, *Megapodius duperryii gouldii*, is worthy of particular note as extending the western limit of the known range of this species.

On the island of Mata Siri Dr. Abbott collected from November 7 to 12, 1907, and from November 25 to December 1, 1908, gathering on these occasions altogether 13 specimens of birds of eight species, five of these representing new subspecies. The most important of the new birds are a bulbul, *Pycnonotus brunneus zaphaeus*, apparently most closely allied to *Pycnonotus brunneus brunneus* from the Malay Peninsula; *Malacocincla abbotti sirensis*, allied to *Malacocincla abbotti olivacea* from the Malay Peninsula; and a drongo, *Dicruropsis pectoralis sirensis*, apparently nearest *Dicruropsis pectoralis solombensis* Oberholser from Solombo Besar Island.

On Pulo Kalambau, which is one of the three largest islands of the Laurot group, Dr. Abbott landed for a day on December 7, 1907. Here he collected two birds, one of them a new subspecies of white-eye (*Zosterops solombensis zachlora*).

From these incomplete collections the faunal relations of Solombo Besar Island seem to be with Java and Timor; and of Mata Siri with Borneo. H. C. O.

ORNITHOLOGY.—*The shedding of the stomach lining by birds, particularly as exemplified by the Anatidae.* W. L. McAtee. The Auk **34**: 415–421, pls. 16–17. 1917.

The shedding of the stomach lining and its disposal by regurgitation, in hornbills and a number of other birds, is well known. It is now shown that this operation takes place commonly in many species of birds, but that the process is usually one of gradual disintegration and mixing with the food contents of the stomach. In this way the discarded lining is ground up with the other food by the rotary movement of the gizzard contents, and passed out of the body through the intestines. This process has been observed in 24 species of ducks and

geese and in the following other birds: *Thalasseus maximus, Himantopus mexicanus, Limnodromus griseus scolopaceus, Colinus virginianus texanus, Cerchneis sparveria sparveria, Coccyzus americanus americanus, Coccyzus erythropthalmus, Pica pica hudsonia, Corvus ossifragus, Sturnella magna argutula, Toxostoma rediviyum sonomae, Mimus polyglottos polyglottos,* and *Hylocichla guttata* subsp.

HARRY C. OBERHOLSER.

ORNITHOLOGY.—*Notes on North American birds. IV.* HARRY C. OBERHOLSER. The Auk **35**: 62–65. 1918.

Recent investigations show that *Pelacanus californicus* Ridgway is a subspecies of *Pelecanus occidentalis* Linnaeus, and should, therefore, stand as *Pelecanus occidentalis californicus* Ridgway. Similarly, *Creciscus coturniculus* (Ridgway) is undoubtedly a subspecies of *Creciscus jamaicensis* and should be called *Creciscus jamaicensis coturniculus* (Ridgway). *Tringa maculata* (Vieillot), has been said to be preoccupied by *Tringa maculata* Linnaeus, and for the species called *Pisobia maculata* the name *Tringa pectoralis* Say has been resurrected. There is, however, no *Tringa maculata* Linnaeus, as this is a misquotation for *Tringa macularia.* Our pectoral sandpiper must, therefore, retain its present designation of *Pisobia maculata* (Vieillot). The form of *Agelaius phoeniceus* breeding in the central northern United States and middle Canada was some time ago described as *Agelaius phoeniceus arctolegus* Oberholser, but has not been considered separable from *Agelaius phoeniceus fortis.* Additional material shows it, however, to be a recognizable race.

H. C. O.

ORNITHOLOGY.—*The birds of Desecheo Island, Porto Rico.* ALEXANDER WETMORE. The Auk **35**: 333–340. 1918.

Desecheo Island lies in Mona Passage west of Porto Rico, and is about one and one-fourth miles long by three-quarters broad. It is a rocky island rising to a peak six hundred feet high, and is covered by jungle or brush. The avifauna is limited to eleven species, only three of which are land birds. Only one passerine bird, *Margarops fuscatus fuscatus,* has been found on the island.

HARRY C. OBERHOLSER.

ORNITHOLOGY.—*Third annual list of proposed changes in the A. O. U. Check-List of North American birds.* HARRY C. OBERHOLSER. The Auk **35**: 200–217. 1918.

This is the third annual résumé of recent ornithological work in so far as it affects North American birds. Like the first and second lists it comprises only ornithological cases,—*i.e.*, such as require specimens or the identification of descriptions for their determination, and consists of additions, eliminations, rejections, and changes of names due to various causes. However, only changes known to be based on revisionary work are included; therefore no mention is made of changes involved in names used without sufficient explanation in local lists or elsewhere. It is intended to include here everything pertinent up to December 31, 1917, not previously chronicled. Some of these changes date back as far as 1910, but were previously overlooked. The present list summarizes the addition of twenty-three genera either new or raised from subgenera; four subgenera; six species detected for the first time in North America, three of these from Greenland; and forty-nine subspecies either newly described or for the first time found in North America. Besides these there are six new subfamilies. H. C. O.

ORNITHOLOGY.—*New light on the status of* Empidonax traillii (*Audubon*). HARRY C. OBERHOLSER. Ohio Journ. Sci. **18**: 85–98. February, 1918.

Few birds are as puzzling as the flycatchers of the American genus *Empidonax*. None of these are more difficult to understand than *Empidonax traillii* and its closely related forms, the status of which has long been in dispute. At present the name *Empidonax traillii traillii* is applied to the subspecies from the western United States, and that from Manitoba and the eastern United States is called *Empidonax traillii alnorum*. A reexamination of the type of *Empidonax traillii* now shows that it belongs to the eastern race; and this should, therefore, henceforth stand as *Empidonax traillii traillii*. This race breeds in most of the wooded parts of Canada and Alaska, in the northeastern United States, west to Montana, and south to Maryland, while it winters southward to Ecuador. The subspecies inhabiting the western United States south to Mexico is renamed *Empidonax traillii brewsteri*. An interesting development of the present study is the discovery of the existence of six more or less well-marked color phases in both of the subspecies. H. C. O.

ENGINEERING.—*Tests of large bridge columns.* J. H. GRIFFITH and J. G. BRAGG. Bur. Stand. Tech. Paper No. 101. Pp. 139. 1918.

Tests were made upon eighteen large bridge columns which were half-size models of chord sections of railroad bridges recently erected at St. Louis, Mo., Metropolis, Ill., and Memphis, Tenn. The specimens were constructed of nickel, Mayari, chrome, silicon, and high carbon steels. They varied in length from 15½ feet to 24½ feet, and in cross-sectional areas from 42 to 119 square inches. The slenderness ratios varied from 15 to 44. The columns were of modern design and were constructed in accordance with approved methods of shop practice and were tested in the 10,000,000 Olsen compression machine of the Bureau at Pittsburgh.

The strengths of the columns varied from a minimum of 31,200 pounds per square inch for the carbon steel to a maximum of 657,000 pounds per square inch for the Mayari steel members, the intermediate values corresponding to the grades of steel used in the construction of the columns. The strengths for twelve columns failing as units were approximately defined by the yield points of the individual steels used in the construction, being confined within a zone determined by the upper and lower limits obtained by independent tests of the component steels. The mean deviation was found to be 0.5 per cent from the mean-yield points determined for the columns at failure, the range of variation being from four to twelve per cent. Of the remaining six columns four failed by local bending at the ends and two by body failures due apparently to the unsymmetrical action of lattice bars.

A full discussion is given of the effects of initial eccentricity, the laws of stress distribution from bending of columns, and the laws of distributions in pin plates and lattice. The analyses were conducted from the point of view of the column formula used in design and the more rational formula based on initial eccentricity in a column.

J. H. G.

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

ENTOMOLOGICAL SOCIETY OF WASHINGTON

The 315th meeting of the Society was held on Wednesday, October 2, 1918, in the hall of the Perpetual Building Association at 1101 E Street N. W. There were present 18 members and 4 visitors.

The editor announced the appearance of the long delayed volume 19, of the Society's Proceedings.

Dr. G. F. WHITE and Mr. R. A. St. GEORGE, both of the U. S. Bureau of Entomology, were elected to membership in the Society.

The program was as follows:

W. M. MANN: *Collecting in Fiji.* Owing to the illness of Dr. MANN this paper was read by title.

R. A. CUSHMAN: *Cocoon spinning habit of two species of Braconids.* This paper, which dealt with the author's observations of the cocoon spinning of two common species, was discussed by Messrs. SCHWARZ, ROHWER, and ABBOTT,

A. B. GAHAN: *A synopsis of the species belonging to the chalcidoid genus Rileya Ashmead.* In the absence of the author this paper was presented by the secretary. It dealt almost entirely with a systematic treatment of the genus Rileya, including all of the known species of the world. The paper was discussed by Messrs. SCHWARZ and ROHWER.

C. N. AINSLIE: *Notes on the economic importance of* Samia Cecropia. This paper was read by Mr. ROHWER and discussed by Messrs. ABBOTT and CUSHMAN.

A. B. GAHAN, *Recording Secretary.*

SCIENTIFIC NOTES AND NEWS

In accordance with the suggestions of the health authorities, several meetings of the scientific societies, regularly scheduled to be held in October, were postponed, on account of the rapid spread of influenza in the city. Among the meetings for which programs had been arranged were those of the Philosophical Society on October 12 and of the Chemical Society on October 10.

Members of the British Educational Mission visited Washington on October 14–18, 1918. The visiting members were: Sir ARTHUR EVERETT SHIPLEY, of Christ's College, University of Cambridge; Sir HENRY MIERS, of the University of Manchester; Rev. EDW. MEWBURN WALKER; Sir HENRY JONES, of the University of Glasgow; Dr. JOHN JOLY, of Trinity College, Dublin; Miss CAROLINE SPURGEON, of the University of London; and Miss ROSE SIDGWICK, of the University of Birmingham.

During the past summer a number of professors of physics have been cooperating with the Bureau of Standards in writing a text book on radio communication. This book is to be used at the various training schools established by the Signal Corps for training radio electricians. Among those who were engaged in this work, and who have recently returned to their respective colleges to resume teaching, are: Prof. F. W. GROVER, of Colby College; Prof. H. M. ROYAL, of Clarkson College of Technology; Prof. G. M. SMITH, of Purdue; and Prof. L. B. WHEELER, of Yale.

Prof. E. C. BINGHAM, of Lafayette College, has returned to take up his work as Professor of Chemistry there. During the past summer he has been in Washington engaged in an investigation of the lubricating oils used in aviation engines.

Prof. A. D. COLE has returned to Ohio State University after spending the summer at the Bureau of Standards, where he has been engaged in research on vacuum tubes.

Prof. G. F. WITTIG, formerly of the University of Pennsylvania, and Mr. G. C. SOUTHWORTH, of the Bureau of Standards, have resigned to take up the teaching of intensive courses in radio now being given by the Signal Corps at Yale University.

Mr. ROY O. FITCH, of the Bureau of Standards, died on October 13, 1918, of complications resulting from an attack of influenza. Mr. Fitch was born in Oregon in 1891, graduated from the University of Oregon in 1912, and entered the government service in 1913 as junior chemist. His work was chiefly on bituminous materials of construction, and he had been engaged recently on war problems connected with the manufacture of prepared roofings for the cantonments and the treatment of the hulls of concrete ships. He was a member of the Chemical Society.

Mr. THOMAS BARTLETT FORD, associate physicist at the Bureau of Standards, died on October 1, 1918, of pneumonia resulting from influenza. Mr. FORD was born October 4, 1882, graduated from the University of Kansas in 1904, and entered the government service in 1907. He had been for several years in charge of the low-temperature laboratory of the Bureau, including the liquid air and liquid hydrogen apparatus, and had devoted considerable attention to the separation of the rare gases. He was a member of the Chemical and Philosophical Societies of Washington.

Prof. DAVID ERNEST LANTZ, assistant biologist in the Biological Survey, U. S. Department of Agriculture, died on October 7, 1918, of pneumonia following influenza, at the age of 63. Prof. Lantz was born in Pennsylvania, March 1, 1855. He was associated with the secondary schools of Kansas and with the Kansas State Agricultural College until 1904, when he became a member of the Biological Survey. He was a member and former secretary of the Biological Society of Washington. His publications were concerned chiefly with ornithology and economic mammalogy.

Dr. HARRISON E. PATTEN, of the Bureau of Chemistry, Department of Agriculture, has been commissioned a captain in the Quartermaster Corps.

Mr. GEORGE A. RANKIN, of the American University Experiment Station, has been commissioned a captain in the Chemical Warfare Service.

Prof. J. E. ROWE has returned to Pennsylvania State College after having spent the summer at the Bureau of Standards working on problems connected with airplane radiator design.

Mr. E. W. SHAW, of the Geological Survey, has been appointed an internal revenue agent under the Treasury Department, and is chairman of the committee on natural gas taxation.

Mr. H. C. RAVEN, of the Smithsonian Institution, who for three years has been collecting mammals and birds in Celebes, arrived in Washington September 28.

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